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ABSTRACT

This paper describes and evaluates a new abstract form of the Purdue Elementary Problem-Solving Inventory. The new test parallels a shortened form of the original Inventory, but presents problems verbally rather than through slides. Both forms were given to advantaged and disadvantaged second- and fourth-graders. For the total sample, the slide version has a KR-20 of .64 and the abstract version, .72. Test-retest reliabilities of .69 and .70 were obtained for advantaged students on the slide and on the abstract form, respectively. The new test seems promising from the standpoint of reliability combined with ease of administration. (Author)

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An Abstract Test of Problem-Solving Ability

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This paper describes and evaluates a new abstract form of the Purdue Elementary Problem-Solving Inventory. The new test-parallels a shortened form of the original Inventory, but presents problems verbally, rather than through slides. Both forms were given to advantaged and disadvantaged second- and fourth-graders. For the total sample, the slide version has a KR-20 of .64 and the abstract version, .72. Test-retest reliabilities of .69 and .70 were obtained for advantaged students on the slide and on the abstract form, respectively. The new test seems promising from the standpoint of reliability combined with ease of administration.

A paper presented at a joint session of NCME-AERA in New Orleans, 1973.

An Abstract Test of Problem-Solving Ability

Objective

The purpose of this paper is to describe a new abstract version of the Purdue Elementary Problem-Solving Inventory (Asher, et. al., 1971) and to present item analysis and reliability data.

Designers of the original Purdue Elementary Problem-Solving Inventory were guided by a thorough review of human problem-solving literature (Feldhusen, Houtz, Ringenbach, & Lash, 1971). Some researchers (Cronbach, 1955; Keislar, 1969(have asserted that the best way to assess problem-solving ability is to use realistic, meaningful, real-life problems. Thus, the Inventory was designed to fulfill these criteria. Since the test was to be administered to children of various ethnic and socio-economic backgrounds, an attempt was made to develop a culturally "fair" instrument (Davis & Eells, 1953). Verbal demands were minimized because lower SES children are often retarded in language development when compared with higher SES peers (Deutsch, 1963). Slides of problem situations were shown, and children were asked to answer questions about the events occurring in the slides. The slides were made from black-and-white line drawings in cartoon form.

For example, in one drawing, a student is studying at a wobbling desk. The Ss are asked what the girl could do to make her desk steadier. The three answer choices are: A) Get a higher chair, B) Place a piece of folded paper under one leg, and C) Press down harder with her pencil. Directions, problem descriptions, and answer choices are recorded on tape and played to the children. Possible answers are written in an

answer booklet, and the child is required to mark his choice. Usually, answers are in verbal form, but, occasionally, pictured alternatives are used. Cartoons of these slides also appear in the answer booklet. The original instrument consists of 49 items.

Method

The new abstract form of the Purdue Elementary Problem-Solving Inventory is a shortened form of the original instrument. The 25 most discriminating items, based on item analysis data, were chosen from the initial 49 questions. Prior to the development of the new abstract form of the test, the cartoon representations of the slides were studied in detail. Verbal descriptions of the events occurring in each slide were then written. The slide showing the girl at her desk is described in the following manner: "A student is sitting at a low desk. She is having trouble writing because the desk is wobbling. What should she do?" Both the problem stem and the possible answers are included in the abstract booklet. Tape-recorded directions, stems, and response alternatives accompany the abstract form. Children are told to read in their booklets while the tape plays.

A new form of the original Inventory was prepared consisting of the same 25 items as the new abstract form. The same items were in the same order in both cases.

Data Source

Subjects for developmental trials were second- and fourth-graders from two schools in Indianapolis, Indiana. One school enrolled large numbers of middle class, advantaged children and the other a large number

of disadvantaged children according to Federal Government criteria outlined in Title I of the ESEA. At each school, subjects were randomly assigned to testing with the original form of the Inventory, shortened to the 25 items, or with the new abstract form. The abstract form was given to 108 subjects, and 102 children received the slide version. An experimenter instructed the children to listen to the recording and to make an "X" in the correct answer box in their answer booklets. Each form of the test took approximately 30 minutes to administer. Advantaged children were retested two weeks after their original testing. The procedure was the same, and 45 of the children who had received the slide version the first time received this version again. Fifty-six children received the abstract version twice.

Results and Conclusions

Item analyses were computed for advantaged and disadvantaged children on both forms of the test. Correlations of .20 or better with the total score were obtained by advantaged students on 21 items of the slide test and on 22 items of the abstract form and by disadvantaged students on 22 items of the slide version and on 20 items of the abstract form. Mean item difficulties on the slide test were .64 for disadvantaged children and .68 for advantaged children. On the abstract test mean item difficulties were .59 for disadvantaged students and .64 for advantaged students. Thus, as expected, the slide form was easier than the abstract form, and disadvantaged children had more difficulty than advantaged children in both cases.

Kuder-Richardson Formula 20 was used to obtain a measure of the

internal consistency of both forms of the test. For disadvantaged students taking the slide test, a KR-20 of .63 was obtained, while for advantaged students, a KR-20 of .67 was obtained. For disadvantaged students, a KR-20 of .60 was obtained on the abstract form, while for advantaged students, a KR-20 of .78 was obtained. The KR-20 for the total sample taking the slide test was .64, while the KR-20 for the total sample taking the abstract test was .72.

Test-retest reliabilities were computed as a measure of the stability of both forms of the test for advantaged students. The slide version has a test-retest reliability of .69 and the abstract version, .70.

Implications

The abstract version is as reliable or more so than the slide version in all of the instances reported. This form seems very promising from the standpoint of reliability combined with ease of administration.

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